CASE REPORT

Pyopneumothorax secondary to *Streptococcus milleri* infectionMohd Jazman Che Rahim,¹ Nurashikin Mohammad,² Wan Syamimee Wan Ghazali²¹Department of Medical, Hospital Universiti Sains Malaysia, Kota Bharu, Kelantan, Malaysia²Department of Internal Medicine, Universiti Sains Malaysia, Kota Bharu, Kelantan, Malaysia

Correspondence to

Dr Wan Syamimee Wan Ghazali, mimeeghazali@yahoo.com

Accepted 8 November 2016

SUMMARY

We report a case of a 46-year-old Malay woman with underlying hypothyroidism post thyroidectomy who presented with worsening breathlessness, orthopnoea, productive cough and left-sided pleuritic chest pain of 3 days duration. Chest X-ray on admission showed left-sided massive hydropneumothorax. Pleural tapping revealed empyema. A chest tube was inserted immediately. The culture of pleural fluid grew *Streptococcus constellatus*. The patient was treated with antibiotics for a total of 6 weeks and underwent open thoracotomy and decortication during admission. Subsequently, her lung condition improved and there was no evidence of recurrence during follow-up.

BACKGROUND

Streptococcus milleri is a commonly recognised pathogen in pulmonary infection. It consists of *S. intermedius*, *S. constellatus* and *S. anginosus*. The spectrum of the disease has a predilection towards abscess formation in various organs. Pyopneumothorax in *S. milleri* infection is a rare manifestation of the disease. The incidence of *S. milleri* infection in a hypothyroid patient had never been reported before. This case report adds valuable information to the current body of knowledge of this infective disease.

CASE PRESENTATION

A 46-year-old Malay woman presented to our hospital in late April 2015 with a chief symptom of breathlessness, left-sided pleuritic chest, productive cough with yellowish green sputum and orthopnoea for 3 days duration. She denied any fever. She also reported of lethargy and poor appetite for few preceding weeks. Despite her minimal oral intake, the patient was gaining weight.

Of note, she had thyroidectomy in 2013 for hyperthyroidism and subsequently was in a state of hypothyroidism and parahypothyroidism. She was on levothyroxine 25 mcg daily and calcium lactate supplement. She was compliant with her medications and follow-ups at a nearby tertiary hospital. She has no other medical illness. There was no history of contact with tuberculosis patients or recent travelling history. There was no history of jungle trekking and swimming in river or lake.

On admission, she was hypoxic and oxygen saturation under room air was 90%. She was obese and had coarse skin. Her blood pressure was 120/70 mm Hg with a pulse rate of 87 bpm. Lung examination revealed stony dullness and reduced breath sound on the left lung field. Chest X-ray

showed a left-sided hydropneumothorax. Pleural tapping performed in the emergency department revealed empyema. A chest tube was inserted immediately. She was empirically treated with intravenous ceftazidime and intravenous metronidazole.

INVESTIGATIONS

Initial blood investigations revealed leucocytosis with predominant neutrophils ($21.43 \times 10^9/L$). Arterial blood gas showed type 1 respiratory failure. Erythrocyte sedimentation rate and C reactive protein (CRP) were raised, 95 mm/hour and 83 mg/L, respectively. Free thyroxine (FT4) was 8.5 nmol/L and thyroid-stimulating hormone (TSH) 21.6 mU/L. Pleural fluid culture grew *S. Constellatus* which was sensitive to ampicillin and penicillin V.

Chest X-ray on admission revealed left-sided hydropneumothorax (figure 1).

HIV screening was negative. Other autoimmune screenings were negative.

DIFFERENTIAL DIAGNOSIS

With an initial presentation with respiratory failure and chest radiograph showing deviated trachea towards the right side, a differential diagnosis of tension pyopneumothorax should be considered.

In terms of causative organism, in our country with high melioidosis burden, the first clinical suspicion was melioidosis. Other differential diagnoses were community acquired pneumonia commonly caused by *Streptococcus pneumoniae*, *Haemophilus influenza* and anaerobic *Streptococcus*. Pulmonary and pleural tuberculosis were also considered.

Figure 1 Chest X-ray revealing left-sided massive pleural effusion with pneumothorax.

CrossMark

To cite: Che Rahim MJ, Mohammad N, Wan Ghazali WS. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2016-217537

TREATMENT

Her condition improved in terms of general condition and oxygenation. The total white cell counts and CRP reduced. She was started on intravenous ceftazidime and metronidazole. However, there was persistent drainage of pus from her left chest tube despite completing 5 days of intrapleural streptokinase. Cardiothoracic surgery team was consulted and open thoracotomy with decortication was carried out. Intraoperative findings revealed frank pus and thick fibrinous peel ~0.5 cm in thickness which was removed.

OUTCOME AND FOLLOW-UP

Her postoperative period was uncomplicated. She was discharged 1 week postoperation with oral cefuroxime after a prolonged hospital stay. A total of 6 weeks intravenous antibiotics which include 4 weeks of intravenous ceftazidime and 2 weeks of intravenous metronidazole were completed. She was discharged with oral cefuroxime for a total of 2 weeks at home. Subsequent follow-up showed improving chest X-ray (figure 2) and general health.

DISCUSSION

Pyopneumothorax is defined as a collection of pus and air in the pleural cavity. It can be localised (encapsulated) or it can involve the whole pleural cavity. Common organisms causing this includes *Mycobacterium tuberculosis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Streptococcus* sp.¹ Common presenting symptoms are cough, chest pain and dyspnoea. Imaging modalities include chest X-ray (pleural effusion), pleural ultrasonography (homogenous echogenic pleural effusion, loculations) and CT thorax (lenticular shape structure which compresses lung parenchyma, 'split pleura' sign, pleural thickening). The principal of treatment is drainage via chest tube and prolonged antibiotics for at least 3 weeks. Further treatment is based on the clinical, biochemical and radiological response.²

The *Streptococcus milleri* group is a heterogeneous group of streptococci which is recognised as a clinically important pathogen. Based on the American system, it comprises three distinct species: *Streptococcus anginosus*, *S. constellatus* and *S. intermedius*. It is a widely distributed commensal which is normally found in the mouth, upper respiratory tract, gastrointestinal tract and vagina. Various presentations of infection have been

found with a predilection towards abscess formation. Common presentations include abscess formation in the brain, lung, liver and even gums.³

Lung disease due to *S. milleri* has been associated with considerable morbidity and mortality. A case study of 25 patients by Conroy A Wong *et al* showed most of the patients needed prolonged stay in the ward due to the infection (median 34 days). Six of the patients died which was attributed to the underlying *S. milleri* infection. Interesting to note that five of the patients with empyema had documented pneumothorax before pleural tapping was performed. The author postulated the possibility of ruptured peripheral lung abscesses for the occurrence of the pyopneumothorax.³

To the best of our knowledge, this is the second case describing pyopneumothorax due to *S. milleri* infection. The first case was published by Phillip Eller *et al*. Their case described a hepatitis C positive patient who was referred for ciprofloxacin-resistant acute bronchitis. Chest X-ray and CT thorax revealed a massive right-sided pyopneumothorax which was drained using a chest tube. Pleural fluid culture grew multiple organisms namely *S. milleri*, *Lactobacillus* spp, *Fusobacterium nucleatum* and *Peptostreptococcus*. The patient was empirically treated with cefuroxime and clindamycin and was discharged to home care after 17 days of hospital stay.⁴ There was no surgical intervention.

S. milleri is known to be susceptible to penicillin, ampicillin and cephalosporins. Other options for patients who are allergic to penicillin include erythromycin, clindamycin and vancomycin. However, *S. milleri* associated thoracic empyema has a high mortality rate even with appropriate antimicrobial treatment ranging from 21 to 24%.⁵

With regard to our case, the decision to continue with intravenous ceftazidime was due to the concern of concomitant melioidosis infection which is highly prevalent in Malaysia.⁶ Empirical coverage for melioidosis was necessary at the time until melioidosis serology IgM result came negative.

Our case report highlights a rare manifestation of *S. milleri* infection causing pyopneumothorax in a patient with hypothyroidism. It has been shown that thyroid hormones may influence the immune system by direct stimulation of splenic dendritic cells by TSH leading to more efficient phagocytic activity and higher cytokine secretion.⁷ TSH may also indirectly effects immune system via triiodothyronine and thyroxine (T4) through both genomic and non-genomic mechanisms.^{8 9}

The likely site of infection in our patient leading to pyopneumothorax was from primary lung infection. Despite the severe nature of her lung condition, she demonstrated lack of fever. The reason for this is obtunded immune response. This might be due to her hypothyroid state as it has been known that the

Figure 2 Resolving left-sided pyopneumothorax.

Learning points

- ▶ Pyopneumothorax in *Streptococcus milleri* infection is a rare manifestation of the disease.
- ▶ Early eradication of the primary source of infection is crucial in determining the clinical outcome of pyopneumothorax patients.
- ▶ It is important to associate surgery to antimicrobial chemotherapy in order to achieve a full clinical recovery.
- ▶ The key principles of management of *S. milleri* infection are early diagnosis, control of the infection with appropriate antibiotics and adequate drainage.

thyroid hormone is involved in body's thermoregulation. This case also adds further valuable information to the current body of knowledge of this infective disease.

Contributors MJCR drafted the manuscript. NM and WSWG approved the final manuscript.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Gupta A, Dutt N, Patel N, *et al*. The different treatment modalities of pyopneumothorax—a study of 50 cases. *Int J Med Sci Public Health* 2013;2: 609–12.
- 2 Management of pleural infection in adults: British Thoracic Society pleural disease guideline. *Thorax* 2010;65(Suppl 2):ii41–ii53.
- 3 Wong CA, Donald F, Macfarlane JT. Streptococcus milleri pulmonary disease: a review and clinical description of 25 patients. *Thorax* 1995;50:1093–6.
- 4 Eller P, Theurl I, Koppelstaetter F, *et al*. Pyopneumothorax due to Streptococcus milleri. *Wien Klin Wochenschr* 2006;118:207.
- 5 Jerng JS, Hsueh PR, Teng LJ, *et al*. Empyema thoracis and lung abscess caused by viridans streptococci. *Am J Respir Crit Care Med* 1997;156:1508–14.
- 6 Guideline for clinical and public health management of melioidosis in Pahang. Jabatan Kesihatan Negeri Pahang. Nov 2010.
- 7 Jafarzadeh A, Poorgholami M, Izadi N, *et al*. Immunological and hematological changes in patients with hyperthyroidism or hypothyroidism. *Clin Invest Med* 2010;33:E271–9.
- 8 De Vito P, Incerpi S, Pedersen JZ, *et al*. Thyroid hormones as modulators of immune activities at the cellular level. *Thyroid* 2011;21:879–90.
- 9 Klein JR. The immune system as a regulator of thyroid hormone activity. *Exp Biol Med (Maywood)* 2006;231:229–36.

Copyright 2016 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow